



New National Science Foundation  
International **R**esearch and  
education **N**etwork **C**onnections  
**Testbed** Solicitation

*And why it matters to WLCG*

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# Overview

The National Science Foundation (NSF) in the US has created a new addition to their International Research and education Network Connections (IRNC) program by adding a Testbeds option. (See solicitation at <https://www.nsf.gov/pubs/2020/nsf20535/nsf20535.htm> )

We believe this is a **very important development** for HEP, especially in the context of preparing for HL-LHC.

In the next couple slides we will briefly describe the program, the potential impact for WLCG and two HEP related submissions that were made last week.



# Context: IRNC Program Description

NSF's IRNC program funds transoceanic networks for science. From the website synopsis:

“The International Research and education Network Connections (IRNC) Base program supports high-performance network connectivity required by international science and engineering research and education collaborations involving the NSF research community. High-performance network connections and infrastructure funded by this program are intended to support science and engineering research and education applications, and preference will be given to solutions that provide the best economy of scale and demonstrate the ability to support the largest communities of interest with the broadest services. Funded projects will assist the U.S. research and education community by enabling state-of-the-art international network services and access to increased collaboration and data services.”

**AmLight:** <https://www.amlight.net/>

**Transpac:** <https://internationalnetworks.iu.edu/initiatives/transpac/>

**NEAAR:** <https://internationalnetworks.iu.edu/projects/NEAAR/index.html>



# Network Challenges Facing HEP

HEP has a number of network challenges that have been discussed in various venues including the LHCONE/LHCOPN meetings, GDB, HEPiX and various WLCG and experiment meetings.

At a high level, we can summarize these challenges as:

- **Capacity:** Run-3 moving to multiple 100G links for big sites, Run-4 targeting Tbps links
- **Capability:** The WLCG experiments need to understand the impact of new features in networking (SDN/NFV) by testing, prototyping and evaluating impact.
  - We will need to evolve our applications, facilities and computing models to meet the HL-LHC challenges; *it will take time*.
- **Visibility:** As the ESnet Blueprinting meetings have shown, our ability to understand our WAN network flows, especially at different locations in the network, is too limited.
  - We need new methods to mark traffic and monitor our network use
  - See new WG charter: <http://cern.ch/go/7ZGG>
- **Testing:** We need to be able to develop, prototype and test network features **at suitable scale**



# Network Testbeds, HEP and HL-LHC

The HL-LHC poses a significant challenge for HEP in terms of the resources and capabilities required to effectively handle the complex data generated.

We expect the network to play a **critical role** in helping to address this challenge by delivering the capacity, capability and visibility to allow us to better utilize the resources we will have available.

**However** we need to understand how the various current and future network services could benefit our work.

To do this requires an “at-scale” network infrastructure which allows us to prototype and evaluate how best to use networks to optimize our future infrastructure ... a network **testbed**



# The Proposals Submitted

There were at least two IRNC testbed proposals submitted which explicitly reached out to HEP/WLCG (and there are likely others, but Rob and I are not aware of them).

## **INSITE:** InterNational Scientific Infrastructure and Testing Environment

- A testbed leveraging AmLight, connecting North and South America, collaborating with ESnet, FABRIC, AutoGOLE and the RNP network in Brazil
- FIU, ESnet, RNP, University of Michigan

## **FAB:** Fabric Across Borders

- An extension of the FABRIC project (<https://fabric-testbed.net/>) internationally, including CERN
- The FABRIC team, University of Chicago

Of course we have no idea if either of these will be funded; what is important is that the WLCG be ready to take advantage of whatever IRNC testbeds get funded.



# Timeline and WLCG Involvement

We expect funding decisions on the IRNC Testbed proposals by mid-to-late summer.

The set of funded testbeds will hopefully inter-operate collaboratively, giving WLCG a more representative footprint to utilize for our prototyping and testing.

We would like to see WLCG sites, as well as the LHC experiments, ready to participate in using whichever testbeds are funded so we can:

- Further our understanding of the role networking could/should play in our software and globally distributed infrastructure.
- Evaluate the impact of reorganizing our resources (e.g., Data Lakes, etc).
- Realistically measure the benefits of utilizing existing and new services within the network AND the costs to incorporate them

Practically, it will be at least 6 months after funding before we anticipate having any kind of useful testing access to the IRNC testbed(s) BUT we should plan to start organizing our efforts as soon as the funding awards are announced.



# Summary and Questions

We wanted to alert the WLCG community about this new NSF program to create international testbeds, capable of supporting testing and prototyping at scales relevant for the HL-LHC, to allow us to prepare to benefit from them.

Thank you!

Questions?



# References

FABRIC Design Overview

[https://docs.google.com/presentation/d/1opK4SfLcDhpAx\\_9nZmrG3pCseh5UI8qQLFGh6hoZkAY/edit?usp=sharing](https://docs.google.com/presentation/d/1opK4SfLcDhpAx_9nZmrG3pCseh5UI8qQLFGh6hoZkAY/edit?usp=sharing)

Research Networking Technical Working Group charter

<https://docs.google.com/document/d/1l4U5dpH556kCnoIHzyRpBI74IPc0gpgAG3VPUp98lo0/edit?usp=sharing>

NSF 2020 IRNC solicitation <https://www.nsf.gov/pubs/2020/nsf20535/nsf20535.htm>